Appendix D
Automatic Identification Technology

INTRODUCTION

The past decade has seen a proliferation of technologies that have allowed DoD to become more efficient and effective. In Somalia, Haiti, and now in Bosnia we use technology to support forces and accomplish the mission. The JTAV system architecture is designed to be flexible and incorporate changes to technologies as well as new technologies as they emerge. The incorporation of new technologies will require the elimination of old technologies. The old technologies will be discarded as they become obsolete.

AIT AND ASSET VISIBILITY

In no area is JTAV as dependent on other programs and initiatives than the first step of collecting data. The best way to ensure the integrity of data collection is by exploiting technology. One of the prime methods for using technology to collect data is automatic identification technology (AIT). AIT enables and facilitates data collection, aggregation, and transmission to AISs. AIT's strength is its ability to capture information rapidly and connect to AISs with little human intervention. AIT improves data quality and timeliness by performing data transfers automatically, thus eliminating time-consuming manual processes and associated mistakes.

The relationship between AIT and asset visibility is often misunderstood. AIT collects data, but by itself is limited in the role it plays in asset visibility. AISs are the foundation of providing DoD's asset visibility capability. After the data are collected, they need to be stored, transmitted, received, and displayed to provide visibility. Consequently the relationship between AIT and AISs is symbiotic. AIT collects and provides data to the AISs, and the AISs provide a context, format, and vehicle for the transfer and display of the data. This relationship requires that the AIT transfer data directly to the appropriate AIS to the maximum extent possible. User data, collected by AIT, will be integrated with DoD systems, technologies, software, and encoding formats as well as with international commercial applications and users.

AIT minimizes the human intervention to collect and transfer data to AISs, and radio frequency (RF) tags practically eliminate human involvement in the data collection effort. Minimizing human intervention is the key to AIT's primary advantages—speed and accuracy—over manual entry. Only seconds are needed to

read a bar code, optical memory card (OMC), or RF tag. Even two or three attempts to read a bar code are faster than manual entry. Additionally, AIT is extremely accurate. AIT automatically collects data so no human errors occur in entry. When using AIT, data collection accuracy approaches 100 percent.

AIT is sometimes viewed as a "toolbox" with many tools. Each AIT device should be selected for the appropriate task based on user requirements for accurate and timely data, process improvement, and enhanced warfighting capabilities. No single AIT device satisfies the myriad DoD requirements. For this reason, DoD needs to consider a mix of AIT capabilities. Although this mix should be based on the application, location is also a factor. DoD needs to coordinate AIT initiatives to prevent a situation where four applications use four separate AIT capabilities at one location when one application can satisfy the requirements.

AIT capabilities are necessary at any place in the logistics pipeline that requires information on assets. The locations are commonly called nodes. Consequently, a node that processes personnel or ships, stores, receives, transports, or repairs materiel, needs an AIT capability. By establishing a network of AIT-capable nodes that transmit data directly to AISs accessible by the JTAV application, DoD can determine where items are in the pipeline. The Joint Staff is leading an effort to develop a worldwide joint AIT architecture to determine nodes that have adequate AIT capabilities. The result will be important for determining where AIT is needed, setting priorities for implementation, and programming funds.

AIT includes a family of technologies that can be used to identify, capture, store, and transmit asset information. AIT devices offer a wide range of data storage capacities ranging from a few characters to thousands of bytes. The information on each device can range, for example, from a single part number to a self-contained database. The devices are interrogated using a variety of means, including contact, laser, or RF, with the information obtained from those interrogations provided electronically to AISs that support DoD's logistics operations.

TYPES OF AIT DEVICES

Examples in the AIT family of technologies include bar codes, magnetic stripes, integrated circuit cards, OMCs, and RF identification (RFID) tags. AIT also includes the hardware and software required to read the information on storage devices and integrate that information with other logistics data. Finally, AIT also includes the use of satellites to track and redirect shipments.

Bar Codes

A bar code is an array of black and white spaces that represent a group of alpha-numeric characters according to a particular symbology. Bar codes include the following two types—linear and two-dimensional (2D):

- *Linear bar codes,* normally limited to about 20 characters, are used to represent a data element that serves as a point of reference in a central database.
- *2D bar codes* have a larger data capacity than linear bar codes (up to 1,850 characters in a single symbol). DoD plans to phase in 2D bar codes as the replacement for linear bar codes.

Optical Memory Cards

OMCs use the optical technology popularized by audio compact disks and are similar in size to a credit card. Information can be written to the card in increments rather than at one time. Consequently, an OMC can have data written to it in a sequential order on many occasions until all available memory has been used. OMCs are particularly useful if an audit trail is necessary or if a large amount of data needs to be stored.

Radio Frequency Identification

RFID technology can be used for various applications. Consisting of transponders and interrogators, RFID is based upon radio wave propagation. Consequently, it has the ability to read tags that are not visible to the naked eye. Transponders are usually small tags that contain data. Interrogators are also referred to as readers and have the ability to write to a tag as well as read it. RFID enables the automated acquisition and entry of identification and other data directly into a computer without human intervention. RFID tags include the following two types—active and passive:

- *Active RFID tags* have their own power source that they use to communicate with an interrogator.
- *Passive RFID tags* use energy from an interrogator. As a result, their capabilities are limited.

Satellite-Tracking Systems

A satellite-tracking system provides the ability to track the exact location of a transceiver because the latitude and longitude are transmitted periodically via a satellite to a ground station. The most active current user of this technology is the commercial motor carrier industry. However, this capability can be easily adapted

to rail, bus, barge, or any other mode of surface transportation, either military or commercial.

AIT CONCEPT OF OPERATIONS

When a DoD logistics asset arrives or departs a commercial or military activity, the AISs at those activities need to capture the departure or arrival information. The information should be provided to logistics decision-makers and customers throughout DoD. As established by the *Logistics Automatic Information Technology Concept of Operations* (CONOPS), the time criteria for users to receive that information are

- 1 hour for all shipments of unit and nonunit equipment,
- 1 hour for all air shipments,
- 4 hours for all ocean surface shipments, and
- 2 hours for all intratheater shipments.[1]

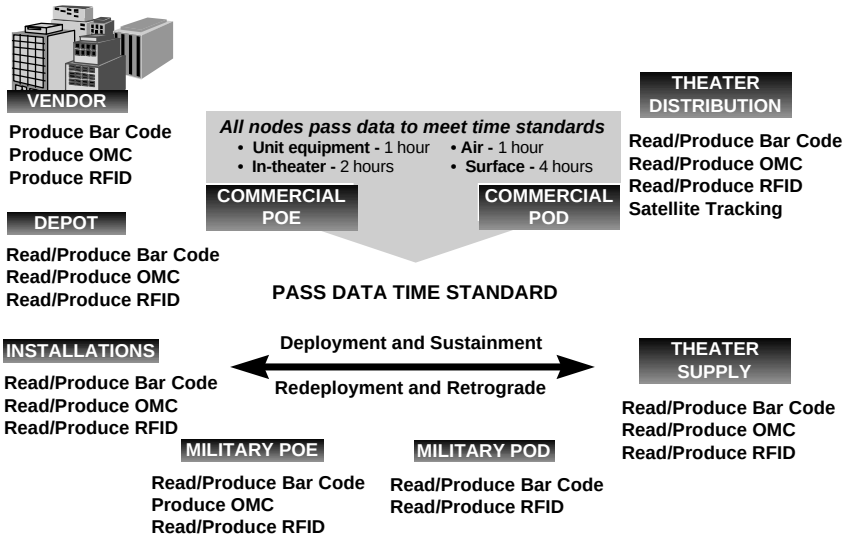
If an existing AIS cannot meet the criteria, it should be upgraded while the immediate customer need can possibly be satisfied by AIT. Because of the wide diversity of DoD's operating environments, the AIT CONOPS calls for a suite of AIT devices that includes linear bar codes, 2D bar codes, OMCs, RFID tags, and satellite-tracking systems.

Figure Appendix D -1 portrays an overview of the AIT CONOPS. The data timeliness criteria indicate the time frames for providing data to a customer after an asset is received or shipped through each link in the chain. For example, as a pallet for an air shipment leaves a depot's shipping dock, the customer needs to know that information in not more than 1 hour. When the shipment arrives at a port's receiving dock, the same time criterion applies—status should be updated in not more than 1 hour. The time criteria continue throughout the pipeline until the shipment is received by the user.

DoD should take the necessary steps to ensure an uninterrupted operational JTAV capability with no degradation in data quality despite local infrastructure deficiencies. Likely trouble spots around the world will not have an infrastructure that permits immediate use of AISs. In that case, AIT can provide an effective means of maintaining a viable JTAV capability. For example, RFID technology is being used in Operation Joint Endeavor to provide timely and accurate shipment data not available in AISs. DoD needs to maintain an adequate level of RFID in peacetime to provide a viable capability during contingencies and develop process improvements.

[1] Deputy Under Secretary of Defense (Logistics), AIT Task Force, *Logistics Automatic Identification Technology Concept of Operations*, November 1997.

Figure Appendix D -1. DoD's Concept of Operations for AIT



Note: POD = port of debarkation; POE = port of embarkation.

AIT STANDARDS

JTAV capabilities are affected by efforts to reconcile and coordinate DoD and national AIT standards. In most cases, DoD standards are not integrated with commercial, national, and international standards. The most basic need is for a DoD standard data format, including data elements, the manner to array them, and the type and capability of the media. Because DoD and the commercial sector are increasingly interdependent, standards need to be compatible. The following standards have been established or are needed:

- *Linear bar code standard.* DoD has had a linear bar code standard—Code 39—since November 1982. However, linear bar codes have not been enforced throughout the logistics chain, and the bar codes produced are not always readable. The AIT CONOPS requires all DoD logistics nodes to be able to read linear bar codes by November 1998. In addition, future contracts, as necessary, will require vendors to bar code items.

- *2D bar code standard.* Although DoD established Portable Data File 417 as the 2D bar code standard for logistics in July 1995, a plan for implementation has yet to be developed. In accordance with the AIT CONOPS, DoD will use 2D bar codes at all DoD logistics nodes by May 1999 and achieve a fully implemented capability within 5 years. AIT equipment contracts, as required, will include provisions for the purchase of 2D bar codes. Future contracts will require vendors to bar code items.

- *OMC standard.* In November 1996, DoD adopted an industry standard for OMCs. This standard, in turn, was based on an international standard recognized by the American National Standards Institute (ANSI), International Organization for Standardization, and International Electrotechnical Commission. OMCs will be implemented on a case-by-case basis as supported by a business case analysis.

- *RFID standard.* No accepted military or commercial standard exists for RFID. Establishing RFID standards will be a difficult task; however, without this first step, the goal of achieving DoD-wide integration will be much more difficult to achieve.

SUMMARY

AIT can improve support to a CINC's warfighting capability and DoD's logistics business processes by facilitating the collection of initial source data and its subsequent transmittal. Because no single technology can satisfy DoD's logistics requirements, DoD needs to embrace a family of technological devices and integrate those devices into its logistics functions. The AIT CONOPS establishes time criteria for users to receive information whenever a logistics asset arrives or departs a shipping activity. AIT can assist DoD activities in meeting those criteria.

In addition, AIT improves DoD's logistics business processes and enhances the ability to satisfy all reporting criteria. It can improve data collection and data sharing by improving the speed of the process and eliminating errors. For JTAV capabilities to realize their full potential, AIT needs to be implemented in a timely manner.